

Made in Vietnam Energy Plan

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For the
Vietnam Business Forum
by



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THE MADE IN VIETNAM ENERGY PLAN - MVEP

Executive Summary

How to use Vietnam's domestic energy resources to stimulate investment in energy generation and to meet Vietnam's climate change obligations

Commissioned by the Vietnam Business Forum - Energy Working Group, with support from Eurocham Vietnam, Amcham Vietnam, and Nordic Chamber of Commerce

Produced by Economic Consulting Associates

Summary:

The Vietnam Business Forum presents this report to outline the advantages of greater emphasis on cleaner domestic solutions for Vietnam's future energy needs and to demonstrate the advantages of prioritizing domestic vs. imported energy resources with respect to Vietnam's social, economic, energy security goals, Vietnam's global and domestic environmental commitments, and to attract private sector investment. The report also provides key policy and regulatory measures that could help move Vietnam towards these goals.

The MVEP focuses on analysis and regulatory support for the following:

1. Energy Efficiency - including the role of Government and using Demand Side Management tools to reduce waste and attract private sector investment and innovation in efficiencies.
2. Renewable Energy - prepare the policy and regulatory framework to enable the further development of successful markets and attract the needed investments in renewables for local and foreign investors, technology and service providers.
3. Vietnam's Natural Gas - accelerate and expand investment in the use of domestic natural gas as a more flexible, cheaper and cleaner fuel than imported coal. Gas remains the least polluting and most cost effective fossil fuel and can serve as a secure bridge fuel with 60 percent less CO₂ emissions than coal.

This report concludes that Vietnam can successfully continue to make maximum use of its indigenous energy resources to reduce the risks and maximise the socio-economic benefits of future energy development building on its achievements to date.

Significant Benefits:

- o A more flexible power development plan that can be adjusted to fit future demand, low or high, and removes the risk of either stranded assets or of failing to meet demand if growth exceeds estimates,

- o A plan that can attract much greater new investment from multiple domestic and foreign sources, in particular mobilising private sector resources, building local manufacturing capabilities, reducing the reliance on foreign governments and for the need of Vietnam government revenues, subsidies and guarantees.
- o Achieve a more efficient use of electricity that will reduce energy waste and make Vietnam more competitive, productive and attractive for FDI.
- o Immediately deliver private investment in cleaner energy after a decade of slow action, thereby freeing Vietnam from its reliance on mega-power coal plants which require many years of lead-time, unnecessary costs and put greater pressure on public sector borrowing and government borrowing capacity.
- o Reduce the social and environmental costs of pollution from a new generation of coal power plants which contribute to poor air quality and high health costs. Following the International Monetary Fund (IMF) calculations, we estimate the costs of health and environmental impacts of the current power development plan with its reliance on coal could be as high as \$15 billion annually by 2030¹.
- o Avoid building a new dependence on the imported fuel of coal with its consequent risks for security of supply and foreign exchange demands.
- o Decrease the heavy financial, logistical and severe environmental costs of transporting coal and coal waste.

Policy and Regulatory Recommendations:

A more sustainable energy future path that attracts investment can be implemented immediately with the enacting of some key policy, regulatory and institution reforms, which have been identified for government and utilities through the advice of supporting donors and private sector experts and which have been successful in other similar countries.

This report advocates giving greater priority to the three national means to securing a low-risk and cost-effective energy future and recommends new imported coal power plants to have the lowest priority in the power development plan to 2030.

1) MVEP proposes that greater use of direct power purchase agreements (DPPA) between power producers and large power consumers should be allowed, as have shown to be extremely effective in other similar countries. Companies such as Apple, Nike, Coca Cola, Google and other multinational corporations have publically made global commitments to work towards using energy from renewables and energy efficient projects. But policies in Vietnam today do not yet allow for DPPA. A change in this policy - allowing enterprises and consumers to have access to clean energy will attract additional investment and global brands that will help carry Vietnam up the manufacturing value chain.

¹ Calculated using planned coal-fired generation of 311 TWh in 2030 and IMF estimates of the health and environmental costs of coal consumption in Vietnam of \$ 2.26/GJ (equivalent to around 8.07/MWh of electricity generated). A cost of carbon of \$ 35/tCO_{2e} is applied. Source: *Getting Energy Prices Right*, 2014, IMF (<http://www.imf.org/external/np/fad/environ/data/data.xlsx>).

2) MVEP suggests a broader look at the cost and revenues of developing offshore domestic natural gas. The development of offshore gas-to-power is less expensive than imported coal power as gas pricing in Vietnam includes significant revenues to the Government with taxes and royalties, revenues which need to be accounted for in accurate cost evaluation. Careful analysis indicates that gas development cost and revenue structure is favorable to imported fuel options. Further, the high cost of "clean coal" technology far outweighs natural gas.

3) MVEP recommends the implementation of the recommendations of GIZ (German Agency for International Co-operation) and the UNDP report on wind and solar PPAs to make bankable PPA Terms and Investable Feed In Tariffs (FIT) for Renewable Energy: at least 10.4 US cent/kWh for wind; and 15 US cent/ kWh for solar power (19 US cents/ kWh on islands) for PPAs with a 20-year term.

4) MVEP recommends a Power Price Roadmap using Market Based Pricing to 2020 with a vision to 2025, including definition of variable pricing between the three main tariff groups – residential, commercial and industrial. The provision of actual cost information can empower consumers and investors as to the most effective way to invest in higher efficiency equipment and processes. Energy efficiency investment and innovation is not occurring in high volume now because consumers believe power prices will remain subsidized by the government.

5) MVEP supports the enhancement of EVN creditworthiness. Increasingly international donors support for renewable and cleaner energy development and procedures to assist the cost of guaranteeing that EVN will pay for power supplied under a PPA for renewable and clean energy projects in Vietnam, wind, solar, biomass, waste to energy and natural gas. The credit enhancement of EVN would aid the government of Vietnam to reach energy and environment goals and help encourage developers to consider Vietnam for financial investment and bankable commercial debt.

6) MVEP encourages the Government to work with the private sector to develop the off shore gas reserves and infrastructure, and encourage additional exploration to bring addition gas on line as soon as possible and reduce the need for imported coal.

7) MVEP encourages the Government to work with the private sector solar experts and business groups in Vietnam and publish a modified Solar Power Decision in 2016 with its supporting regulations in the form most likely to attract private capital investment.

8) MVEP recommends tax incentives and regulatory fixes to individual households and businesses to reduce energy use and to encourage installation of solar, wind or other renewable energy sources to relieve pressure on the power distribution system.

9) MVEP recommends greater inclusion of private sector investment into smart grid and smart transition technologies and effective cost saving solutions.

10) MVEP recommends mandatory energy efficiencies and construction requirements for particular products such as appliances, generators, air condition units, as well as construction standards for housing, office, factory and retail development.

11) MVEP recommends the development of small or large scale well-structured waste to energy system, especially to benefit local communities to (1) improved health and

hygiene, and (2) to increase power supply, and 3) to decrease carbon emissions and health effects from open burning of agricultural waste and trash.

12) MVEP recommends a public education campaign to alert the general public to the individual ability to reduce energy waste and increased awareness of ways to protect a clean environment for the good of all people and generations to come.

Key messages

Overview:

To assist Vietnam in supplying its growing energy needs, its climate change goals from COP21 and to achieve its economic development goals, the Vietnam Business Forum has produced the "Made in Vietnam Energy Plan" (MVEP). Building on the Power Development Plan VII (MOIT revised for 2016-2030), the Exploring a Low - Carbon Development Path for Vietnam (Audinet et al., sponsored by the World Bank Group 2016), the Renewable Energy Development and Potential in the Greater Mekong Sub-region Report (ADB 2015), and the World Bank "Financial Recovery Plan for EVN", the MVEP lays out the significant opportunities available for Vietnam to attract greater private and public sector investment to support the \$100 billion that Vietnam estimates it needs to keep up with the energy demand through 2030.

The MVEP outlines how energy needs can be met with greater emphasis on cleaner domestic sources of energy such as renewables including biomass, wind and solar; sustainable energy efficiencies; and the increased development of Vietnam's offshore natural gas - all contributing greatly to electricity needs while reducing the effects on the environment and the need for imported coal.

The MVEP report works to provide cost and environmental analysis, with regulatory and tax policy recommendations that can lead to greater private sector investment and innovation for the use of indigenous energy resources, while meeting Vietnam's energy and environmental goals.

Current situation:

According to Vietnam's current Power Development Plan (PDP VII) released in late March 2016, projects 55 GW of power to be fueled by coal by the year 2030 - up from 14 GW today. PDP VII proposes the percentage of coal fired power in Vietnam's energy mix by 2030 increase bringing coal to 53.2% of installed capacity.

This increase in coal energy would be primarily fueled by importing coal - at great financial cost and risk. It would require Vietnam to import approximately 10 million tons of coal per year beginning in 2017, an enormous financial and transportation burden that could be reduced by using domestic sources of energy as outlined in the MVEP.

Vietnam currently ranks the 20th largest user of coal fired plants generating 14 GW of electricity. By some estimates Vietnam in 2030 would then be burning 15 times as much coal as it did in 2012. This would make Vietnam the eighth-largest user of coal for electricity generation in the world with levels similar to those of Russia and Indonesia despite a Vietnam population projected at only two-thirds of the Russia and one-third of the Indonesia - and at great health and environmental cost.

The 14 planned coal-fired power plants in the Mekong Delta by 2030, add a total capacity of around 18 GW to the south. Last year, a joint study produced by Green Peace and Harvard University estimated that air pollution created by coal-fired power plants kills around 4,300 people in Vietnam each year; the study estimated that toll would rise to 25,000 per year if the Mekong Delta plants went into operation.

In May 2016, World Bank President Jim Yong Kim said a decision by Vietnam to build the full 40 GW country wide would be a “disaster” for the planet, and announced the bank would devote 28% of its funding to helping developing countries invest in renewables.

MVEP is designed to recommend greater use of Vietnam's own resources of natural gas, efficiencies, and renewables that can change that the financial and environmental picture going forward, and attract the investment necessary to make it a reality.

Vietnam's current power plan emphasises coal

Vietnam plans to add 90GW of electricity capacity between 2015 and 2030

Vietnam's power demand has grown and continues to grow rapidly, reflecting the country's economic development. Between 2000 and 2015, electricity peak demand grew from 4.9 GW to 25.8 GW or by an average of 12% annually. Latest projections are for continuing near-double digit increases with peak demand reaching 42 GW by 2020, 63.5 GW by 2025 and over 90 GW by 2030.

Electricity generating capacity has grown proportionally. Installed capacity in 2000 was 6.4 GW. By 2015 it was 38.6 GW and is planned under the recently revised Power Development Plan VII (PDP VII) to increase to 60 GW by 2020, to 96.5 GW by 2025 and to 130 GW by 2030.

Should imported coal increasingly dominating the power generation mix?

Historically, Vietnam's generation mix has been hydro-dominated. However, this is changing rapidly. In five years, the share of coal-fired generation in total output has doubled from 17% in 2010 to 34% in 2015. Hydropower's share is also now around 34%, equivalent to that of coal. The share of gas-fired generation has declined from 43% in 2010 to 29%.

Current plans are for continued expansion of coal-fired generation using imported coal as indigenous hydro resources become more limited. PDP VII projects 55 GW of power to be fueled by coal by the year 2030, and primarily fueled by importing coal.

Vietnam currently ranks the 20th largest user of coal fired plants generating 14 GW of electricity. By some estimates Vietnam in 2030 would then be burning 15 times as much coal as it did in 2012 becoming the 8th largest user of coal for energy globally.

Imports of coal would have to increase from 1.3 MT in 2015 to 64 MT by 2020 and to 155MT by 2030 for these coal power plants. Total investment required for the development of this coal import subsector is estimated at VND 109,156 billion from 2016 -2020, VND 373,273 billion for 2021-2030.

Additional coal mining costs to environment and transportation infrastructure

But these numbers also assume a rapid expansion of domestic coal mining which would be accompanied by significant environmental impact. Without additional investments to reinforce environmental management at the mining project and strategic levels, costly cleaner mining technology, and strengthened regulatory compliance for environmentally sustainable management of natural resources, there will be additional environmental impact and risk to increased mining.

Additional costs would also be added to the government budget to improve and maintain the transport sector of ports, roads, trains, and associated costs of moving and handling such tonnage of domestic and/or imported coal.

The cost differential between new clean coal power generation and the older greatly polluting technologies need to be accurately assessed. For

Coal shifts its infrastructure cost onto the Government

every ton of coal burned in existing plants - which do not use clean technologies - it is estimated that 2.86 tons of carbon dioxide is created.

The cost and emissions differences between subcritical, supercritical, and ultra-supercritical versions of coal combustion plants and integrated gasification combined cycle (IGCC) plants are substantial. Subcritical, supercritical, and ultra-supercritical are not considered clean coal. IGCC plants or "clean coal" have theoretical advantages in controlling emissions; however, the technology has been deployed at only a handful of very costly plants worldwide.

Currently, the term clean coal is used in the coal industry primarily in reference to carbon capture and storage, which pumps and stores CO2 emissions underground, and plants using integrated gasification combined cycle (IGCC). While it is possible to remove most of the sulfur dioxide, nitrogen oxides, and particulate matter emissions from the coal-burning process, carbon dioxide (CO2) emissions and radionuclides are far more difficult to manage. Furthermore there are several studies pointing out how cleaning the air has the potential to move the pollutants into the water table, causing additional problems.

"Clean" coal is far more costly than current plants

Carbon capture and sequestration technology thus far has not made economic sense globally and will not likely be improved unless its costs sharply decline or the use of carbon tax makes the elimination of carbon dioxide emissions a significant competitive.

Refer to the following WoodMackenzie's analysis for new plant economics by technology in Vietnam (Commodity Market Update June 2016), the Break-even costs of power for coal steam green field Subcritical and Supercritical technology vary from \$61 to \$68/Mwh. For IGCC, its power break-even cost is about 30% higher than Supercritical coal combustion plant mainly due to its higher capital cost.

New plant economics by technology (LRMC)

	Coal Steam Greenfield Australian Bituminous	Coal Steam Greenfield Indonesia Sub-bituminous	Coal Steam Greenfield Indonesia Sub-bituminous
Technology	Supercritical	Supercritical	Subcritical
Generic US\$/kW	1,600	1,600	1,250
Efficiency	38	38	36
Capacity Factor	85.0	85.0	85.0
Economic Life yrs (or payback)	30.0	30.0	30.0
Gross Fuel Cost (HHV) (US\$/mmbtu)*	3.25	3.10	3.10
Components			
Fixed (US\$/MWh)	33.5	33.5	27.1
Variable (US\$/MWh)	34.0	32.6	34.3
Break Even (US\$/MWh)	67.5	66.1	61.3

*Source: Wood Mackenzie, *Levelised price forecast for 25 years (2020 to 2045)
Assumptions: Debt to equity 75%, post-tax return on equity 20%, pre-tax interest rate 10%, tax rate*

Because domestic gas provides significant revenues to the government (approximately 40% of total project value), gas is cheaper on actual cost and on a social basis vs. imported coal.

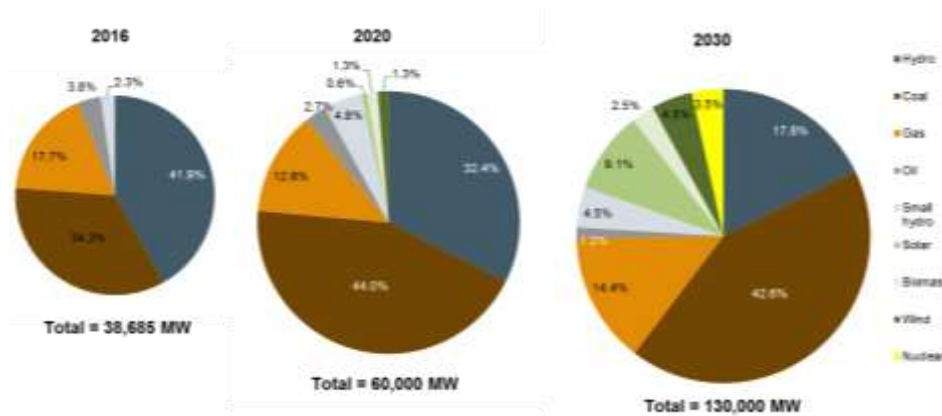
Offshore gas is cheaper than coal and generates revenue

	Gas CCGT	Coal Steam Greenfield Australian Bituminous	Coal Steam Greenfield Indonesia Sub-bituminous	Coal Steam Greenfield Indonesia Sub-bituminous
Technology	H Class	Supercritical	Supercritical	Subcritical
Generic US\$/kW	1,050	1,600	1,600	1,250
Efficiency	54	38	38	36
Capacity Factor	85.0	85.0	85.0	85.0
Economic Life yrs (or payback)	25.0	30.0	30.0	30.0
Gross Fuel Cost (HHV) (US\$/mmbtu)*	6.84	3.25	3.10	3.10
Components				
Fixed (US\$/MWh)	20.4	33.5	33.5	27.1
Variable (US\$/MWh)	45.7	34.0	32.6	34.3
Break Even (US\$/MWh)	66.1	67.5	66.1	61.3

Source: Wood Mackenzie, *Levelised price forecast for 25 years (2020 to 2045) Assumptions: Debt to equity 75%, post-tax return on equity 20%, pre-tax interest rate 10%, tax rate 20%

PDP VII shows by 2030, at the earliest nuclear power is also expected to enter the generation mix with a share of 3.5% of all output. LNG shows promise for longer term as well but remains more expensive than the development of Vietnam's off shore gas resources.

Figure 1: Under PDP VII, generating capacity is increasingly coal-dominated



Source: PDP VII official revision March 2016 and ECA

Efficiencies

Electricity demand growth has exceeded income growth, the result has been a rapid rise in electricity intensity. Between 2004 and 2014, the growth of electricity demand has been outpacing that of GDP growth. In

**Vietnam's
inefficient
electricity use
is expected to
worsen**

2004, producing one dollar of GDP required 0.9 kWh of electricity. By 2014, this had risen to almost 1.5 kWh of electricity for one dollar of GDP (at constant prices).

Compared to the 70% increase in electricity intensity seen in Vietnam over this 10-year period, other countries in the region have seen flat or declining intensities. Vietnam's electricity intensity now exceeds that of China and is approaching levels seen in such notoriously inefficient countries as the Ukraine. And projections are for further increases in electricity intensity reaching as high as 2.3 kWh for each dollar of GDP by 2030. The implication is clear – Vietnam is hugely inefficient in its use of electricity and projected to remain so without significant regulatory correction.

The main constraints facing Energy Efficiency measures are:

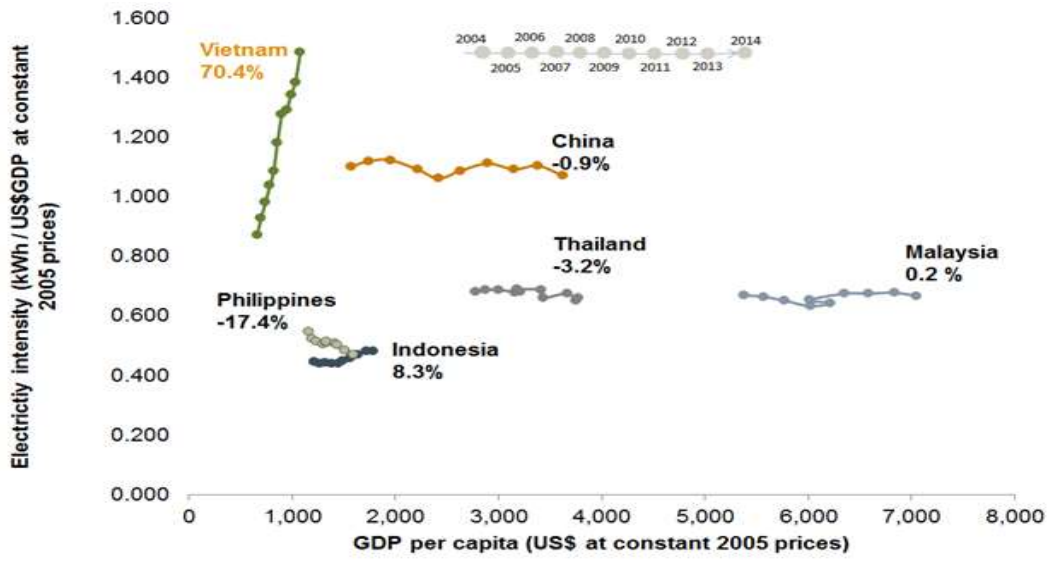
- (i) a lack of policy framework and its enforcement,
- (ii) too low electricity tariffs, and
- (iii) financial mechanisms for investment in energy efficient technology and conservation.

Globally, countries have added regulatory requirements on household, office, factory and other electricity using technological innovation and updated equipment to enhance efficiencies. Such regulatory requirements have led to investment in innovation and savings.

Building construction and manufacturing codes can greatly reduce electricity use in office, residential, retail and factory buildings and manufacturing production. Raising prices to reflect actual costs has been shown to reduce use across the board, enhance revenue streams and enabling governments to focus resources on assistance for the truly needy.

Additionally, educating the public to the benefits of energy saving and ways to participate would help build support for renewables and efficiencies, and encourage innovation, private sector investment, involvement and support for an overall plan to build a clean and sustainable environment in Vietnam.

Figure 1 Vietnam's electricity intensity is extremely high and growing rapidly



Source: ECA calculations using data from BP Statistical Yearbook (electricity generation) and World Bank (real GDP and GDP per capita).

The development path should not come at high social and environmental cost and at high risk

An ever-expanding role for coal will continue this trend and make it harder for Vietnam to meet its health, environment and future climate change commitments.

The health and environmental costs of Vietnam's PDP could reach \$15 billion by 2030

Using costs calculated by the International Monetary Fund (IMF), we estimate the costs of health and environmental impacts of the current power development plan could be as high as \$15 billion annually by 2030².

Other studies also highlight the harmful impacts of Vietnam's planned coal dependency. A recent Harvard report³ estimated that coal-fired power plants lead to 4,300 premature deaths every year in Vietnam, while the number may rise to 25,000 annually if the planned expansion of coal power is implemented in full⁴.

Respiratory and other health ailments can be directly attributed to poor air quality. The September 2016 World Bank Report "The Cost of Air Pollution - Strengthening the Economic Case for Action" <https://openknowledge.worldbank.org/handle/10986/25013>.

This report estimates that total deaths from air pollution in Vietnam reached over 66,000 in 2013. They estimate total forgone labor costs are equivalent to USD \$1.5 billion and total welfare losses are equivalent to USD \$23.8 billion.

The report World Bank report also notes that "In urban areas of Vietnam, for example, the prevalence of acute respiratory illnesses is twice as high in low-income households as in high-income ones.

The disproportionate health burden suffered by poor households is due not only to higher exposure to air pollution but also to factors such as lower resistance to illness, simultaneous exposure to other environmental health risks, and inequalities in access to and use of basic services."

The combination of rapid increases in electricity demand, growing electricity intensity and a rising share of coal-fired generation means that Vietnam's carbon dioxide emissions have already greatly increased. Between 2000 and 2010, emissions per capita fell on

² Calculated using planned coal-fired generation of 311 TWh in 2030 and IMF estimates of the health and environmental costs of coal consumption in Vietnam of \$ 2.26/GJ (equivalent to around 8.07/MWh of electricity generated). A cost of carbon of \$ 35/tCO_{2e} is applied. Source: *Getting Energy Prices Right*, 2014, IMF (<http://www.imf.org/external/np/fad/enviro/data/data.xlsx>).

³ http://acmg.seas.harvard.edu/presentations/2015/koplitz_japan_symposium_20150529.pdf

⁴ Greenpeace Southeast Asia 2015, available at: <http://www.greenpeace.org/seasia/Press-Centre/Press-Releases/Coal-expansion-in-Vietnam-could-claim-25000-lives-per-year/>

average by 8% in OECD countries while in Vietnam they increased by 150% per capita.

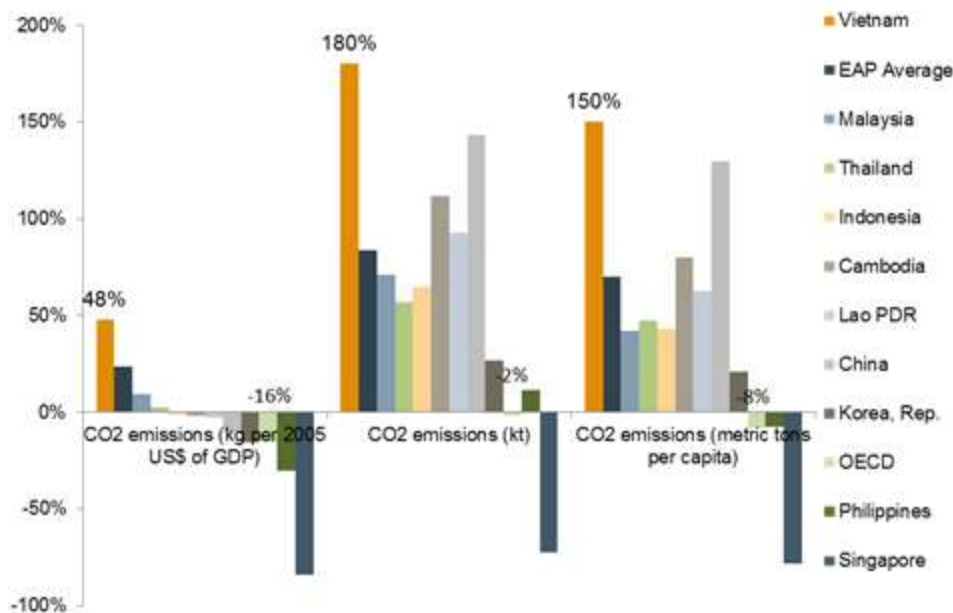
The Vietnamese most recent initiative Green Growth Strategy, Decision 1393/QĐ-TTg: 2012 which fits well with the MVEP, also identifies energy and transport sectors as priority for reduction of greenhouse gas emissions and sets out clear goal, i) reducing greenhouse gas emissions intensity and promoting of clean and renewable energy, ii) enhancing green lifestyle and sustainable consumption.

The current path makes Vietnam's global commitments on climate hard to achieve

In line with the above, Vietnam has developed 'The Plan for Implementation of the Paris Agreement' on climate change, calling for 8% reduction of GHG emission compared to Business as Usual levels today.

Under the Vietnam Green Growth Strategy (VGGS), the government is targeting a reduction in carbon dioxide emissions of 20% by 2030 relative to the business as usual (BAU) scenario. Vietnam's Intended Nationally Determined Contribution submitted ahead of COP21 targets a reduction in emissions of 8% relative to the BAU case and up to 25% with international support as well as committing the government to expanding the role of renewable energy in the supply mix.

Figure 2 Vietnam's carbon emissions are growing at the fastest rate in the region



Source: World Bank (2015) Vietnam Low Carbon Options Assessment

The heavy reliance on large coal-fired plants introduces significant risks into the power development plan. A reliance on a single fuel to provide the majority of supplies is inherently risky. For example, growing international concerns over the emissions impacts of coal

may come to be reflected in international commitments to impose carbon taxes – whether at source or whether on the fuel input. Vietnam's planned heavy reliance on imported coal-fired generation makes it extremely vulnerable to any such moves.

There is a high risk of mismatches between supply and demand given the difficulty of demand forecasting

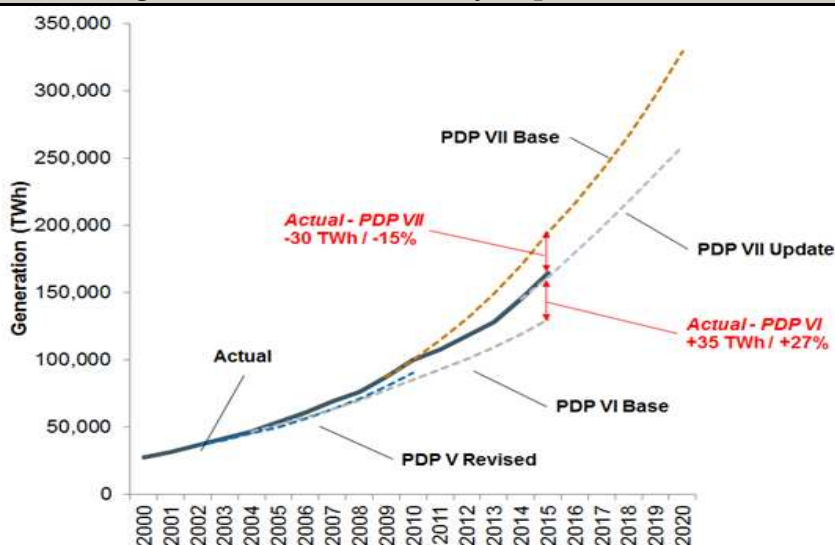
By their nature, coal plants are large and 'lumpy' investments with long lead-times. This introduces the risk that, in an environment of uncertain demand growth coupled with decreasing funding for coal projects, Vietnam may find that it faces either stranded assets where incremental capacity additions exceed demand growth or cannot respond sufficiently rapidly to unanticipated accelerations in demand. By contrast, small-scale renewables projects, for example, can generally be deployed more rapidly and in small increments allowing for a modular approach to generation capacity investment which tracks changing demand.

That this risk is real can be readily seen from the changing demand forecasts across Vietnam's PDPs. The approved PDP VI forecast total generation in 2015 of 130 TWh while the actual figure was 164 TWh. The original PDP VII, as approved in 2011, by contrast projected a requirement of 194 TWh.

The difference between the actual requirement in 2015 and the PDP VI forecasts represents a shortfall of five large coal power plants⁵. That gap between the actual and the PDP VII forecast represents an excess of four coal power plants. These are large and costly investments to commit when the need for them is so uncertain. By 2030, the difference in projected capacity needs between the original and revised PDP VII demand forecasts, issued just four years later, is equivalent to 20 GW or 17 large coal power plants.

⁵ Assumes a coal plant with installed capacity of 1,200 MW and capacity factor of 75%.

Figure 3 Historical difficulty in power demand forecast



Source: ECA research

EVN can finance half of PDP VII investments projected.

The risks of being unable to finance the current power development plan are also high. Our estimates are that the implied generation investment requirements are around \$6.9 billion annually on average between 2015 and 2020 and rising to \$11.4 billion annually between 2020 and 2030. For comparison, EVN’s annual investment in generating capacity as stated in its annual reports was \$2.3 billion in 2013 and \$2.8 billion in 2014.

This financing gap will need to be covered from private sector investment, domestic and foreign sources, and from potentially limited loans from international financial institutions and donors.

External finance for coal power is declining rapidly

But increasingly, many potential investors have policies preventing them lending for coal-fired generation projects. The constraints imposed on coal projects by the World Bank, Asian Development Bank and other institutions are expanding.

Many other infrastructure and private sector investors are also increasingly ruling out new coal-fired investments. For instance, the Norwegian Government Pension Fund Global (NGPFG), one of the top ten investors in the global coal industry, will start divesting from coal. AXA, France’s largest insurer recently decided to divest mining companies that get more than 50 percent of their revenue from coal. Engie (the former GDF-Suez) has ruled out investing in or developing any new coal-fired plants.

Vietnam will become increasingly dependent on investments from a declining number of countries or sources which continue to support

coal fired power with resulting geopolitical risks. Vietnam may not be able to finance new coal plants with new or old technologies at all or only at excessive costs, risk, and further delays.

Funding for clean energy in emerging markets is abundant and growing

By contrast, financing of clean energy investments is a booming market, and not one that Vietnam is currently sharing in.

Indonesia attracted \$1.9 billion in clean energy investments in 2014. Individual provinces and states in China and India also attract more than Vietnam as a whole – in 2014 Yunnan province alone received \$4.5 billion in clean energy investments and Rajasthan in India received \$1.5 billion. South Africa, also heavily coal-dependent, was able to generate clean energy investments of \$1.4 billion in 2014 and as much as \$5 billion in wind and solar investments in each of the preceding two years.

Vietnam receives a small fraction of renewable investment

In contrast, current regulatory and policy decisions inhibit growth in renewables. Total clean energy investment in 2014 in Vietnam was estimated at just \$67 million and has fallen sharply from \$821 million in 2009 with the discouragement of new small hydro projects⁶.

Increasing carbon-intensity may also harm future FDI

The use of renewable energy is also becoming increasingly important for many major multinational corporations. Increasingly multinational companies such as Apple emphasizes the importance of its global partners using clean energy to power their facilities and supports their investments for this purpose. More and more companies are looking to continually reduce their carbon emissions per unit of output by promoting energy efficiency and renewable energy supplies.

A power sector that is becoming increasingly carbon-intensive is one that is moving away from the requirements of many major foreign investors, and away from the Paris Agreement.

⁶ Climatescope Annual Report, 2015.

The Made in Vietnam Energy Plan offers alternatives

MVEP prioritizes Vietnam's domestic energy resources

MVEP would maximize Vietnam's domestic energy resources as an alternative to more imported coal. In doing so, it offers stable electricity production, a better risk-cost tradeoff, better health, lower emissions and pollution, and a better environment overall.

There are three pillars to MVEP:

- o Increasing *energy efficiency* and drive out waste
- o Further increasing the role of *renewables* in the generation mix.
- o Making maximum use of Vietnam's *domestic natural gas* resources.

The revised PDP VII already represents an important step forward in utilising Vietnam's abundant renewables resources. By 2030, out of an estimated potential of 27 GW of wind capacity and 13 GW of solar capacity, the revised PDP VII targets 6 GW of wind and 12 GW of solar capacity in addition to up to 12 TWh annually (2% of the total) being supplied from biomass generation and increases in small hydro capacity.

Renewables capacity is expanding globally

Nevertheless, we believe more can be done. Specifically, we have assumed a doubling of wind capacity to 12 GW by 2030 is possible, which would represent utilising half of Vietnam's potential.

Similar countries like Mexico, India and Brazil who have invested in wind energy by attracting private investment were able to bring down wind development costs during the last five years with a combination of incentives to attract private investments, developers and foreign direct investors wanting renewable energy sources.

Renewables costs are going down rapidly

More recently Vietnamese contractors have shown the ability to quickly reduce construction time and cost once technology transfer take place. Costs of wind turbines continue to drop as turbines become more efficient. We also anticipate a small contribution from geothermal power.

In general, the costs and prices of a wide range of renewable solutions are coming down dramatically as innovation and investment, climate change awareness and commitments are growing. Vietnam needs the regulatory environment to take full advantage of these innovations and to encourage wide participation of the public and domestic enterprises.

Make use of Vietnam's domestic gas resources

The revised PDP VII anticipates new gas supplies from Block B and the Ca Voi Xanh field which allow for an expansion of gas-fired generating capacity of 6.75 GW by 2026. A further 5 GW of capacity using imported LNG is planned by 2028. By 2030, domestic gas consumption in the power sector is projected to increase to around 12 BCM annually compared to 8 BCM at present. LNG imports will reach around 6 Mtpa compared to zero at present.

The planned level of consumption of domestic gas represents only a small part of Vietnam's resource potential. Proven reserves are reported at 600 BCM and resource estimates from the US Geological Survey are for total resources of 1,000 BCM. A November 2015 report from Wood MacKenzie estimates recoverable reserves in Block B in Southern Vietnam alone at around 100 BCM which would be sufficient to replace 20 million tonnes of imported coal.

For years, there has been significant delays in developing these gas resources - yet involving foreign and domestic players are willing and prepared to make the necessary investment to bring these projects on line.

Increasing domestic gas is cheaper and benefits society as a whole

In the past, inaccurate assessments over the reported higher cost of gas development and resulting impacts on customer bills have been the major barrier to expanding domestic gas use in electricity generation. But this argument does not accurately account for large government revenues (taxes, royalties and profit sharing), which come from domestic gas development, which are not available for power projects using imported fuels.

Based on the Production Sharing Contract (PSC) revenue split in 2014, press reports indicated that the delivered price of gas for Block B to O Mon power plants could be between \$8.00 and \$9.00/MMBtu which would have been split as \$4.80-5.40 to the domestic and foreign developers and \$3.20-3.60 to the government as revenue.

Depending on the gas to power project, approximately 40 - 60% of the "cost" of gas is actually the Government's revenue share—a share that can be reinvested in Vietnam to the benefit of society as a whole. The present value of the Government's income from Block B alone over its lifetime has been estimated by Wood MacKenzie at USD \$3 billion.

Gas fired power plants provide less negative and more positive impact and benefits

And of equal importance, the economics of gas development make it attractive to private sector investment - foreign and domestic - projects could be up and running with global support and meeting national security, energy independence and climate change goals.

A greater shift toward natural gas would carry tremendous benefits for the Vietnam's revenues, the consumers and the environment. Natural gas is affordable, reliable, efficient and available. It is also the least carbon-intensive of the major energy sources, emitting up

to 60 percent less CO₂ emissions than coal when used for electricity generation.

The revised PDP VII does make significant and welcome changes from the original plan issued in 2011, but an energy plan for Vietnam could go much further.

Conclusion

Improved energy efficiency can reduce demand by more than 10%

Vietnam can build a path of cleaner and more sustainable energy independence and reaching the goal of 70% private sector investment into the energy sector, by increasing focus on greater development of domestic sources of power.

The reports three main pillars for a Made In Vietnam Energy Plan:

Energy Efficiencies

MVEP increases the flow of funds into Vietnam's economy for the power sector

The high levels of electricity intensity in Vietnam relative to its regional peers needs bold action.. Numerous studies have highlighted the great potential for Vietnam to improve energy efficiency, and a public education campaign is needed.

The most recent assessment, contained in the World Bank's *Exploring a Low-Carbon Development Path for Vietnam* (2015) is that, by 2030, electricity demand can be reduced by 61 TWh relative to a BAU scenario or equivalent to around 11% of projected requirements in that year. Of this reduction, two-thirds come from improved energy efficiency in industry and one-third from improvements in the efficiency of household and commercial appliances.

Renewables Energy

Not captured in most figures is the increased potential under MVEP for money spent on efficiencies, renewables and off shore gas to be recycled into Vietnam's economy. Efficiencies and renewables, by virtue of the small-scale of individual projects, are far more suited to domestic financing, innovation and ownership than large coal plants. This means that the jobs and profits on these investments are more likely to be retained in Vietnam.

When World Bank President was in Vietnam in May 2016, he said of renewables "We are bringing to the table all the tools we need to bring the costs down significantly and quickly."

Offshore Gas to Power

As a backbone fuel, increasing the share of domestic gas in the mix also returns funds to Vietnam – under current fiscal terms around 40% of the revenues from sales of natural gas accrue to the

government for spending in Vietnam.

By contrast, LNG and imported coal revenues flow abroad in most cases. The development of domestic natural gas should be maximized to reduce Vietnam's dependence on the costs and risks of imported fuel.

Overall

**A Made in Vietnam
Energy Plan
increases
Vietnam's national
security overall**

Finally, MVEP increases national security for Vietnam. It reduces the reliance on a single fuel, imported coal. And it makes it more likely that new generation can be financed in a timely and affordable manner while not leaving Vietnam dependent on a decreasing number of financiers and countries willing to continue to invest in large coal plants and coal mining.

Through policy, regulatory, institutional and public education efforts, Vietnam can build a path to an efficient, clean, sustainable and secure energy future.

VBF VIETNAM BUSINESS FORUM

The Vietnam Business Forum (VBF) was established in 1997 during the Consultative Group meeting between the Vietnamese Government and its donor partners of the World Bank and IFC, as a not-for-profit business consortium for public-private dialogue to help develop a more favorable business environment that attracts domestic and foreign private sector investment and stimulates sustainable economic development in Vietnam. This is done primarily through high profile bi-annual Forums between the business community and Vietnamese leadership and through specialized Working Groups cutting across many sectors.

The bi-annual Forums addresses the government of Vietnam at the highest level of leadership with participation of up to 12 ministries. The events are regularly Chaired by the Prime Minister and co-chaired by Vietnam's Minister of Planning and Investment, the World Bank's Vietnam Country Director, IFC's Representative for Vietnam and Co-chairmen of the Consortium. The goal of the Forums and Working Groups is to provide the government with concrete policy proposals and specific feedback on existing conditions.

CONSORTIUM MEMBERS



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